

NAVIGATION STUDY
BRIDGEPORT HARBOR, CONNECTICUT AND VICINITY

IMPROVEMENTS TO
EXISTING FEDERAL DEEP DRAFT PROJECT
AT BRIDGEPORT HARBOR

AUGUST 1984

SUMMARY

This Congressionally authorized study was undertaken to determine the engineering-economic feasibility and social-environmental acceptability of modifying the existing 35-foot-deep entrance channel and turning basin at Bridgeport. It also considered other navigational needs as related to recreational boating improvements at Black Rock Harbor, the Pequonnock River, and Cedar, Burr, Ash and Johnsons Creeks.

Whereas, our findings indicate sufficient economic justification for Federal involvement, local interests and harbor users are unable at this time to meet the local assurance requirements necessary for project implementation. Therefore, we recommend that this project be deferred until the local interests are able to meet their local assurance requirements.

Bridgeport is the most populated city in Connecticut and is home of the second largest port in the state. Located 50 miles northeast of New York City and 20 miles west of New Haven, along the north shore of Long Island Sound in southwestern Connecticut, this highly industrialized city, with a 1980 population of nearly 143,000 serves as a major oil and general cargo receiving center for western Connecticut and southwestern Massachusetts.

The commercial navigation needs at Bridgeport Harbor concerns additional channel depth and maneuvering area to handle the larger vessels now being used in the petroleum trade as well as the need for attendant berthing improvements. Some lightering (partial offshore unloading) of larger tankers and cargo vessels to smaller vessels now occurs so that larger vessels can enter the harbor at high tide stages. Nearly 85 percent of the 3.2 million tons of waterborne commerce handled in the harbor in 1981 consisted of petroleum products, of which nearly 24 percent was transhipped to Connecticut's six other ports.

The selected plan entails deepening of the existing main ship channel to a depth of 40 feet at mean low water (while retaining the existing 400-foot channel width), enlarging the existing 18-acre turning basin to 28 acres and deepening to 40 feet, and designating an additional 10 acres (now exceeding 25 feet in depth) to restore the 25-foot main harbor anchorage to its full 23-acre dimension.

The plan also includes commensurate dredging at related terminal berthing areas. The project would require the removal of an estimated 1.7 million cubic yards of organic and inorganic silt, silty to gravelly sand, and clay. Clamshell bucket cranes mounted on barges are proposed for the dredging activities. Dredged materials would be transported by bottom dumping scows to the Central Long Island Sound Disposal Area, about 15 miles east of Bridgeport for pointdumping. Dredging would not be done during the warmer months (June through September) which are critical to the spawning of oysters.

The cost of the selected plan, based on June 1984 price levels, is estimated at \$11,470,000, including \$10,000 for the installation of additional navigation aids. Local and/or private interests would fund the deepening of their user berths and estimated at a cost of \$1,540,000. The dredging cost of the main harbor channel and turning basin improvements, presently estimated at \$9,930,000, will be in accordance with financial arrangements that are determined to be acceptable to the Administration, Congress, and the local interests. Total annual maintenance cost of the project including replacement and relocation of buoys as needed, is estimated at \$117,000. Maintenance dredging would be required at a frequency of once every 10 years and based on an estimated shoaling rate of 24,000 cubic yards per year.

The main harbor improvements would permit more efficient use of the harbor through increased use of larger vessels and reduction of tidal delays. It would result in long-term reduction of unit transportation costs through savings in waterborne transportation costs.

The selected plan was found to be economically justified. Annual charges of \$1,088,000 when compared to annual project benefits of \$1,755,000 yield a benefit-cost ratio of 1.61.

The Division Engineer finds that although navigation improvements to Bridgeport Harbor and vicinity are economically feasible, local interests cannot meet the local assurance requirements. Therefore, he recommends that this study be deferred until such time as local interests can financially participate in the project.

NAVIGATION REPORT BRIDGEPORT HARBOR AND VICINITY CONNECTICUT

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NAVIGATION REPORT

BRIDGEPORT HARBOR AND VICINITY, CONNECTICUT

STUDY AUTHORITY

Concern over existing hazardous navigation conditions in the Bridgeport Harbor main channel and turning basin, and other channels in the vicinity prompted local interests to request their Members of Congress to initiate a study of Bridgeport Harbor and vicinity. Accordingly, a navigation study was conducted by the Corps of Engineers in accordance with a resolution adopted on 6 April 1977 and at the request of Senators Abraham Ribicoff and Lowell P. Weicker, Jr., which reads as follows:

"RESOLVED BY THE COMMITTEE OF PUBLIC WORKS OF THE UNITED STATES SENATE, that the Board of Engineers, for Rivers and Harbors be, and is hereby, requested to review the reports on Bridgeport Harbor, Connecticut, submitted in House Document No. 136, 85th Congress, 1st Session, with a view to determine the economic justification and environmental acceptability of providing navigation improvements for deep draft vessels, commercial fishing boats, recreational craft and related purposes in Bridgeport Harbor, including the harbor's tidal tributaries and nearby Black Rock Harbor, Cedar and Burr Creeks, and the tidal portion of Ash Creek."

STUDY PURPOSE AND SCOPE

This navigation study reports upon the need for commercial navigation improvements at Bridgeport Harbor, as well as recreational needs at the Pequonnock River, Black Rock Harbor and Cedar Creek and Ash Creek, all within or adjacent to the city of Bridgeport Connecticut.

The study area extends from the Ash Creek tidal arm of the Rooster River which marks the Fairfield-Bridgeport boundary on the west; Black Rock Harbor, Cedar Creek and Burr Creek in southwestern Bridgeport; Bridgeport Harbor, the tidal arm of the Pequonnock River and Yellow Mill Channel in southeastern Bridgeport; to the tidal arm of Johnsons Creek which marks the Bridgeport-Stratford boundary on the east, as shown in Figure 1. Studies were made of the immediate and future regional needs for expansion of deep-draft navigation facilities at Bridgeport and Black Rock Harbors and for additional recreational boating facilities in the smaller waterways. Studies were made in sufficient detail needed for plan selection and feasibility determination.

EXISTING FEDERAL NAVIGATION PROJECT

Bridgeport harbor is serviced by an existing 3.6-mile-long entrance channel, 35 feet deep and 400 feet wide, extending from Long Island Sound past two rock breakwaters protecting the outer harbor; an 18-acre, 35-foot-deep turning basin at the east side of the head of the entrance channel; a 23-acre, 25-foot-deep anchorage immediately seaward of the turning basin; and a 1-mile-long inner channel, 35 feet deep and 300 to 600 feet wide extending to the Interstate 95 highway bridge.

Eastward of the existing turning basin, Johnsons Creek is serviced by a 15-foot-deep, 250-foot-wide channel in its lower reach and a 9-foot-deep, 100-foot-wide channel in the upper reach. Two small 9-foot-deep and 6-foot-deep anchorages are located at the west side of the head of the lower reach, and a 6-foot-deep anchorage lies at the head of the upper channel.

Midway along the east side of the inner main harbor, a 1-mile-long channel has been constructed in Yellow Mill (Pond) Channel, 18 feet deep and 150 to 200 feet wide.

At the head of the inner harbor, a 1.3-mile-long channel has been dredged in the Pequonnock River, 18 feet deep and 200 feet wide at the lower end and 125 feet wide at the upper end.

In the Black Rock Harbor Reach, about 2 miles westward of the main harbor, a 2.4-mile-long channel, 18 feet deep and 200 feet wide extends from Long Island through the harbor to Cedar Creek, decreasing in width to 150 feet through the creek to two stub channels at the head of the creek.

NEEDS

Bridgeport, the most populated city in Connecticut with a 1990 population of 142,546, is located midway between the cities of New Haven and Stamford along the north shore of Long Island Sound, about 50 miles northeast of New York City.

City officials, acting through their congressional delegation, requested the Corps of Engineers to study the feasibility of deepening the present 35-foot-deep main ship channel; deepening and enlarging the present 35-foot-deep maneuvering area as well as provide breakwater protection and dredging improvements for commercial or recreational navigation in five tributary waterways.

The present 35-foot depths in the main harbor limit vessels to high-cost partial loads at Bridgeport Harbor, or require them to bypass the harbor entirely. While the size of visiting deep-draft vessels had been increasing during the 1960's and 1970's, the hazard of inadequate depths, particularly in the maneuvering area, has constrained the size of vessels visiting the harbor in recent years. This has impacted on shippers and

terminal operators who strive to ship or receive commodities at the least cost per ton. In view of the world trend to larger vessels, some carriers visiting Bridgeport Harbor are partially loaded, which results in greater unit transportation costs that are ultimately passed on to the consumers. Channel and maneuvering area modifications would improve navigation safety and permit more cost-efficient movement of the waterborne commerce.

City officials also indicated a need for deepening the access to the municipal dock at the head of the inner harbor, which is used as a terminal by the Bridgeport-Port Jefferson (NY) ferry. Because analysis determined that deepening of the berthing area was a local responsibility, the ferry company lessee is modifying the dock face so as to provide the 30-foot depth desired by local interests.

City officials also indicated the need for recreational navigation improvements in Johnsons Creek, the Pequonnock River, Black Rock Harbor, Burr Creek and Ash Creek. In view of a large, unsatisfied demand for wet storage of recreational boats in the Bridgeport area, they requested that additional access channels, anchorages, mooring basins and public marina areas be provided in these smaller waterways. In addition, local interests stressed the need for breakwater protection at Black Rock Harbor so as to eliminate wave damages to boats and waterfront structures in Black Rock Harbor and Cedar Creek, and to provide protected anchorage for small craft in Black Rock Harbor.

EARLIER NAVIGATION STUDIES AND PROJECTS

Since 1827, Bridgeport Harbor, its tributary waterways; Black Rock Harbor, Cedar and Burr Creeks about 2 miles to the westward; and Ash Creek about one-half mile further to the west have been the subject of 26 Corps of Engineers studies in the interest of navigation. A listing of these studies is shown in Table 1.

Federal improvements at Bridgeport Harbor began in 1836 when an 8-foot-deep channel was dredged over the outer bar. Further work through 1963 included two entrance channel breakwaters; successive dredging of the main channel to depths of 14, 20, 22, 25, 30 and 35 feet; an inner harbor turning basin with successive depths of 30 and 35 feet; 18-foot channels in the Pequonnock River and to Yellow Mill Pond; main harbor anchorages of 18 and 25 feet; and a 15-foot channel in Johnsons Creek, decreasing to 9 feet in the upper reach, plus a 9-foot small-boat anchorage and two 6-foot anchorages in the upper reach.

TABLE 1
Previous Corps of Engineers Reports on Bridgeport (CT) Navigation Studies

<u>Preliminary Examinations</u>			<u>Survey or Feasibility Reports</u>			<u>Where Published</u>						
<u>Report Date</u>	<u>Finding</u>	<u>Report Date</u>	<u>Estimated Proj. Cost</u>	<u>Finding</u>	<u>COE (1) Finding</u>	<u>House/ Senate</u>	<u>Num- ber</u>	<u>Cong- gress</u>	<u>Ses- sion</u>	<u>COE Ann Year</u>	<u>Rept. Page</u>	
AshCreek Mar 2, 1936	Unfavorable				Unfavorable							
Black Rock Harbor		Feb 15, 1827	6,201			H	52	20	1			
		Jun 9, 1831	10,900									
Nov 8, 1882	Favorable	Dec 12, 1883	80,000			S.Ex	*50	48	1	1884	666	
		Oct 30, 1888	157,609	Favorable	Favorable				1	1889	741	
		Oct 30, 1888	1,025,000	Favorable	Favorable					1889	741	
Bridgeport Harbor		Sept 26, 1838	52,800									
		Dec 11, 1852	10,000									
		Jan 12, 1867										
		Jan 23, 1869		Unfavorable						1869	413	
		Jan 12, 1871	72,000			H.Ex	60	41	3	1871	788	
		Jan 12, 1871	566,922			H.Ex	60	41	3	1871	788	
		Jul 1, 1874	126,050									
		Jul 14, 1879										
		Oct 28, 1895	90,000			H	*61	54	1	1896	803	
		Aug 23, 1898	307,470	Favorable						1899	1173	
		Jan 20, 1899	110,000			H	209	55	3	1899	1187	
		Jan 20, 1899	65,000			H	209	55	3	1899	1187	
Nov 21, 1906	Favorable	Dec 18, 1906	560,000	Favorable	Favorable	H	275	50	2			
						H	*521	50	2			
Sep 1, 1909	do	Feb 1, 1910	90,000	do	do	H	*751	61	2			
Jan 6, 1911	Unfavorable				Unfavorable	H	*89	62	1			
Nov 25, 1912	Favorable	Mar 19, 1914	175,300	Favorable	Favorable	H	*898	63	2			
Jan 31, 1928	do	Jul 26, 1929	877,000	do		H	281	71	2			
		Jul 26, 1929	504,000		Favorable	H	281	71	2			
Feb. 26, 1936	do	Mar 10, 1937	192,500	Favorable	do	H	*232	75	1			
		Apr 9, 1940	529,000	do	do	H	*819	76	3			
		Apr 26, 1946	955,000	do	do	H	*680	79	2			
		Oct 19, 1956	2,076,000	(2)	do	H	*136	85	1			
Johnsons Creek												
Nov 25, 1912	Favorable	Mar 19, 1914	19,800	Favorable	Favorable	H	*898	63	2			

* Included maps

(1) Chief of Engineers

(2) Plus \$465,000 estimated cash contribution by local interests (\$148,000 contributed)

Federal work in Black Rock Harbor began in 1836-38 with construction of a seawall across a breach in the southern part of Fayerweather Island to protect a lighthouse and prevent harbor shoaling. Work continued in 1884-94 with dredging of a 6-foot-deep channel up Cedar Creek and construction of a 2600-foot-long breakwater (now buried by sand) connecting Fayerweather Island with the mainland. Work through 1931 entailed successive dredging of an 18-foot channel in Black Rock Harbor, Cedar Creek and its two stub channels at the head of the creek, plus a 9-foot channel in Burr Creek. Two breakwaters at the mouth of Black Rock Harbor and a 28-acre anchorage 6 feet deep in Burr and Cedar Creeks were authorized in 1958, but were never constructed as required local cash contributions were not forthcoming.

No federal navigation improvements have been made in Ash Creek along the Bridgeport-Fairfield boundary.

EXISTING CONDITIONS

Completed Navigation Project

Bridgeport, the largest industrial center in Connecticut, is located along the north shore of Long Island Sound, in Fairfield County, southwestern Connecticut, about 20 miles west of New Haven. The main harbor is situated in the southeastern section of the city, at the mouth of the 21-mile-long Pequonnock River. Three tributary waterways are located generally east of the inner harbor, namely Yellow Mill Pond Channel to the northeast, Johnsons Creek to the east and Lewis Gut to the southeast. As shown in Figure 1, Black Rock Harbor, a small harbor about 2 miles to the west in the southwestern section of the city, is part of the existing federal navigation project.

Authorized as two separate projects in 1836, Bridgeport and Black Rock Harbors were modified in 1871, 1875, 1878, 1882, 1884, 1888, 1892, 1894 and 1896. The two projects were combined and modified in 1899, and further modified in 1907, 1919, 1930, 1937, 1945, 1946 and 1958.

The main harbor work, completed in 1963, provided for the following:

- a. A main channel 35 feet deep at mean low water, 400 feet wide, extending about 3.6 miles from Long Island Sound to Tongue Point (at the west side of the inner harbor), widening to about 600 feet at the bend about 0.2 mile upstream opposite the Cilco Terminal, and narrowing to 300 feet at the Interstate 95 bridge about 1.0 mile upstream; and an 18-acre turning basin, 35 feet deep, south and southeast of the Cilco Terminal.
- b. Two rubble mound breakwaters, one 3,823 feet long on the easterly side, and one 2,110 feet long on the westerly side of the entrance to the main harbor.

c. Two anchorage basins, one 25 feet deep and 23 acres in area opposite Tongue Point and one 18 feet deep and 29 acres in area adjoining the west side of the inner harbor channel west above Tongue Point.

d. Pequonnock River Channel, 18 feet deep, extending about 1.3 miles to a point about 500 feet below the dam at Berkshire Avenue; and narrowing in width from 300 feet at the Interstate 95 bridge, to 200 feet above the Stratford Avenue bridge, to 175 feet above the Congress Street bridge, to 125 feet above the East Washington Avenue bridge to the head of the channel.

e. Yellow Mill Pond Channel, 18 feet deep, and 200 feet wide at the entrance at Cooks Point, midway along the east side of the inner harbor channel, and narrowing to 150 feet over a distance of about 1 mile.

f. Johnsons Creek Channel, 15 feet deep and generally 200 feet wide for a distance of about 2800 feet from the eastern end of the 35-foot-deep turning basin, then 9 feet deep and 100 feet wide for a distance of about 1,100 feet to the vicinity of the Interstate 95 bridge.

g. Three anchorages along Johnsons Creek, one 9 feet deep over 2.4 acres at the west side of the head of the 15-foot channel, one 6 feet deep over 0.6 acre at the northwest side of the first anchorage, and one 6 feet deep over 2 acres at the head of the 9-foot channel.

The Black Rock Harbor work, completed in 1931, provided for the following:

a. Construction and maintenance of shore protection on Fayerweather Island, including a seawall to close a breach between the north and south parts of the island.

b. Black Rock Harbor and Cedar Creek Channel, 18 feet deep and 200 feet wide in the entrance channel, 150 feet wide in Cedar Creek and 100 feet wide in the two branch channels at the head of the creek, extending about 2.4 miles from the 18-foot contour in Long Island Sound to the head of the two stub channels.

Total cost of the completed new work was \$4,261,000 including local cash contributions of \$148,000. The project is shown on U.S. Coast and Geodetic Charts 12369 and 220, on Figure 1 accompanying this report, and partially shown on the U.S. Geological Survey Bridgeport quadrangle map.

Authorized Project

In addition to the completed work discussed above, the project as authorized by Congress in 1958 provided for the following project features:

a. Two rubble mound breakwaters, authorized but not constructed, at the entrance to Black Rock Harbor, one 900 feet long on the easterly side of the harbor and one 650 feet long on the westerly side of the harbor.

b. A 28-acre, 6-foot-deep anchorage, authorized but not dredged, in Burr Creek and on each side of Cedar Creek adjacent to Burr Creek, and abandonment of a prior 7-foot channel in Burr Creek.

Tides

The tide at Bridgeport Harbor has a mean range of 6.8 feet and a mean spring range of 7.7 feet. Near the outer harbor breakwaters the mean tide level is 3.4 feet above mean low water (MLW). The extreme low water level is minus 3.5 feet MLW. The maximum recorded storm surge level is 9.2 feet NGVD. The maximum tidal flood current is 0.7 knots between the breakwaters, and the maximum ebb current is 0.6 knots.

At the entrance to Black Rock Harbor, the tide has a mean range of 6.9 feet, the spring range is 7.9 feet and the mean tide level is 3.4 feet above mean low water. Tidal currents and flood levels are similar to those at Bridgeport Harbor.

Water Quality

The waters of Bridgeport Harbor, Black Rock Harbor and Ash Creek are classified "SC" by the Connecticut Department of Environmental Protection. This classification indicates a limited suitability for certain fish and wildlife, recreational, boating, certain industrial process and cooling, and good aesthetic value. "SC" water is not suitable for bathing and is considered unacceptable. The State's water quality goal is "SB" which would be suitable for bathing and offers excellent fish and wildlife habitat.

A major factor in the harbor's water quality is the combined sewage overflows involving two secondary sewage treatment plants. One is located near the head of Power House Creek, north of the Cilco terminal at the east side of Bridgeport Inner Harbor. The other is located west of Cedar Creek and north of Burr Creek. Although both plants generally discharge within the secondary standards, the released nutrients, solids and coliform bacteria contribute to long-term degradation of both harbors.

Other factors are the industrial discharges which occur in the area. Shorefront situated industries under permit are allowed to discharge effluents with limited deviations in temperature, pH, dissolved solids, metals, and oil and grease. The discharge of dissolved metals by some industries has been recently curtailed by the Connecticut Department of Environmental Protection.

Threatened and Endangered Species

There are no federally listed or state designated threatened, endangered or rare species residing in the area. Potential transients could entail the shortnose and Atlantic sturgeon, bald eagle, peregrin falcon, Ipswich sparrow and Cooper's hawk.

Historical-Archaeological Features

There are no recorded prehistoric archaeological sites within the project impact areas, and no historical sites would be impacted by the proposed dredging works.

EXISTING SOCIOECONOMIC CONDITIONS

Population

The resources of a region to a large degree determine the status of its economic well-being and growth potential. A general understanding of these resources and development trends is helpful in identifying regional problems and needs and selecting appropriate solutions. Although the city of Bridgeport is one of nine communities in the Bridgeport Standard Metropolitan Statistical Area (SMSA), it has the greatest influence on decisions concerning harbor improvements, and would be most affected by such improvements. In addition to Bridgeport, which had a 1980 population of 142,546, the SMSA includes the town of Stratford (50,541) and the city of Milford (50,898) to the east, the city of Shelton (31,314) and the town of Derby (12,346) to the northeast, the town of Trumbull (32,989) and the town of Monroe (14,010) to the north, the town of Easton (5,962) to the northwest, and the town of Fairfield (54,849) to the west.

Port Activities

The two harbors have 40 piers, wharves and docks, of which 20 handle dry cargo, 10 handle petroleum products, one services a ferry and nine service principally recreational boats. Major docks in the main harbor are Shell Oil (Buckley Brothers), Cilco (City Lumber Company), the city-owned Union Square Dock (which services the Long Island Ferry) and the Steel Point and Tongue Point Stations (owned and operated by the United Illuminating Company).

Eleven docks are located along Black Rock Harbor and its tributaries, 13 along Bridgeport main harbor, three along the Pequonnock River, four along Yellow Mill Channel and five along Johnsons Creek. Facilities at Ash Creek consist of a municipal marina immediately inside the entrance for Fairfield residents.

There is one repair facility at the east side of Bridgeport Inner Harbor with a marine railway that can handle vessels up to 120 feet in length. Two boatyards and five marinas have smallboat repair

facilities. The nearest facilities for making major repairs or drydocking deep-draft vessels are located at the Port of New York or at New London Harbor in eastern Connecticut.

Renovation of the Union Square Dock at the head of the main channel is in progress, and expansion of ferry service to Port Jefferson, New York is planned. The Cilco Terminal Co. plans to expand its multipurpose terminal at the east side of the inner harbor, but is unable to obtain sufficient land at this time. A Free Trade Zone has been designated on municipal land at the north side of Burr Creek, but no water access is planned or desired as all access to this 3-acre site will be by truck.

Waterborne Commerce

Bridgeport Harbor, New Haven Harbor (20 miles to the east) and New London Harbor (nearly 60 miles to the east) are the three deep-draft harbors in the state. Petroleum products are transshipped to three inland waterways and three smaller ports in the state. The port is second busiest harbor (to New Haven) in Connecticut and eighth largest in New England. It has experienced a steady growth in tonnage since the 35-foot-deep channel was completed in 1963.

Freight traffic through the port was 3,212,851 short tons in 1981, of which 85 percent consisted of petroleum products and crude petroleum. Principal commodities handled were imports of residual fuel oil, primary metal products, lumber, distillate fuel oil and nonmetallic minerals; coastwise receipts of gasoline, residual fuel oil, distillate fuel oil, crude petroleum and sand, gravel and crushed rock; coastwise shipments of residual fuel oil and distillate fuel oil; local shipments of residual fuel oil and crude petroleum; and exports of paper waste and sugar. The Union Square Dock at the west side of the head of the main harbor provides major passenger and auto ferry services to Port Jefferson on the north shore of Long Island, New York. Table 2 shows comparative tonnage for the period between 1960 and 1981.

TABLE 2
Bridgeport Harbor Tonnage, 1960-1981

<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>
1960	2,090,396	1971	3,548,554
1961	2,312,586	1972	3,471,623
1962	2,518,424	1973	3,553,980
1963	2,445,928	1974	3,295,195
1964	2,349,442	1975	2,860,171
1965	2,458,938	1976	3,265,113

1966	2,489,475	1977	3,495,140
1967	2,985,583	1978	3,735,609
1968	3,436,096	1979	3,243,301
1969	3,847,560	1980	3,194,618
1970	3,843,722	1981	3,212,851

Vessel Traffic

Fully loaded 37,000 deadweight ton (DWT) vessels, having lengths of 660 feet and drafts of 35 feet, are the largest vessels that can enter Bridgeport's main harbor at this time. Larger vessels up to 765 feet long with DWT of 70,000 have, in past years, entered the harbor partially loaded. Because of insufficient depth in the maneuvering area needed to approach the Illuminating Company terminal, U.I. has had a voluntary, restrictive policy dating back to 1977 that no ships destined for U.I. would have a draft of more than 32 feet. Some vessels have experienced difficulty in approaching the Cilco terminal because of inadequate deep water near the southern end of the existing maneuvering area. This has caused the need for occasional lightering of larger vessels. Most tankers that previously docked at the Shell Oil Company terminal at the southeastern end of the harbor, prior to that firm's shift to the use of barges, had no difficulty in reaching the terminal because of the favorable east-west elongation of the existing maneuvering area. However, some minor shoaling has occurred in recent years at the south end of the maneuvering area. Figure 2 shows the locations of the main harbor terminals.

All large vessels entering the harbor are tug assisted. Due to insufficient deepwater maneuvering area, deep draft vessels are often required to wait for high tide before entering the harbor. As a result, many vessels using Bridgeport Harbor have been towed barge-type vessels in recent years with shallow drafts of 20 feet or less.

The trend in deep draft vessel usage is to increase the carrying capacity to take advantage of reduced transportation costs. Thus, the use of vessels with larger deadweight tonnage and deeper drafts will be increasing in the future. Without channel improvements, only shallower draft and partially full vessels will be able to use the harbor. Therefore, a deeper harbor at Bridgeport would enable larger vessels to eventually replace tow barge-type vessels.

There is no specific data on the movement of recreational boats throughout the harbor areas, although the regional trend is for the expansion of recreational fleets. The following listing provides an approximate breakdown as to the numbers and locations of recreational boats based in the area.

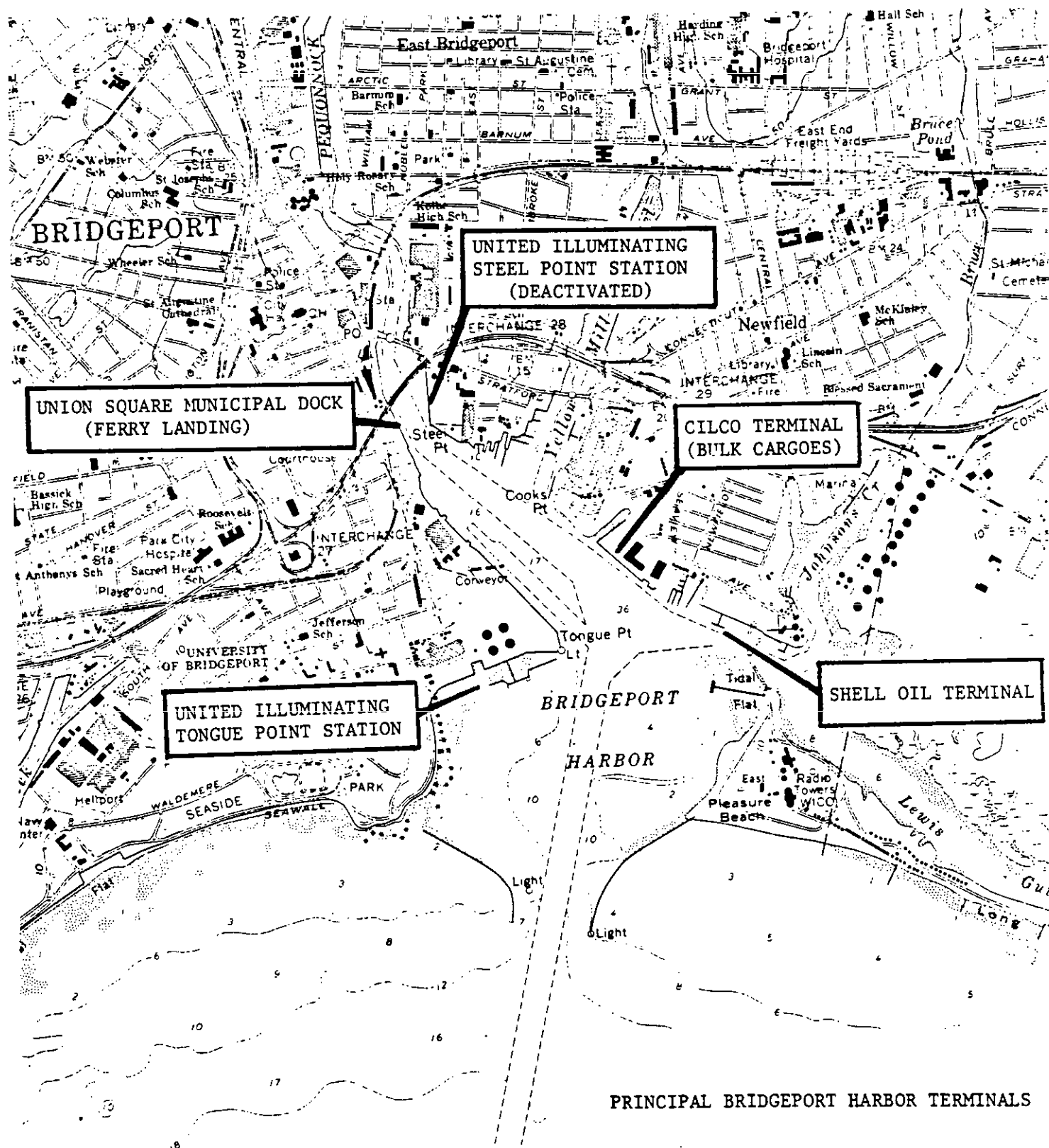


FIGURE 2

Ash Creek	700
Black Rock Harbor	1,000
Bridgeport Harbor and Pequónnock River	400
Johnsons Creek	500

Total Recreational Boats	<u>2,600</u>
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Operational constraints for recreational boats are the lack of additional mooring or berthing areas, exposed harbor conditions at Black Rock Harbor and the 7-foot vertical clearance (at mean high water) of the Pleasure Beach swing bridge, when the bridge is in the closed position.

FUTURE CONDITION IF NO FEDERAL ACTION IS TAKEN

For Bridgeport and Black Rock Harbors, the without-project condition would mean that the existing channels would be maintained with no additional improvements. Continued caution would be needed by ship pilots in guiding the 60-plus largest ship passages each year, some consisting of partially loaded tankers that would draw 40 feet if fully loaded, in order to avoid accidents and possible oil spills.

If a federal program for improving general navigation facilities is not implemented, potential development and effectiveness of the port would be hindered. This could in turn reduce the economic vitality of the port and the region that depends upon its services. As vessels in the foreign and U.S. fleets continue to increase in size and the older, smaller vessels are phased out of service, harbors with limited depths such as Bridgeport will be hard-pressed to attract ocean commerce. By 1995, more than 50 percent of all petroleum products are expected to be delivered in tankers. This condition could result in constriction of the market area served by the port and possible negative impact on industrial and waterfront expansion.

Shippers of petroleum products would have to lighter larger vessels on a regular basis. Transfer of petroleum from tankers to barges increases the potential for oil pollution incidents. While the amount spilled through lightering is unknown, the spillage rate has been estimated at one-half barrel per million barrels transferred. With continued use of larger tankers by the shipping industry and without channel improvement at Bridgeport, lightering activities could be expected to increase, further magnifying the present environmentally unsatisfactory situation.

In the short term, deliveries required to keep fuel oil and gasoline terminals along the tributary channels supplied are expected to continue. Three of the six terminals near the head of Cedar Creek, all serviced by barges, supply about 60 distributors with home heating oil. The single petroleum-barge terminal along the middle reach of the Pequonnock River receives about three million barrels of fuel oil annually. The large gasoline-fuel oil terminal along the east side of

Johnsons Creek is serviced by four pipelines extending from the Shell Oil terminal located at the eastern end of the main harbor turning basin.

While it would be unreasonable to assume that all waterborne commerce at Bridgeport would ultimately be suspended in the long term, traffic would be limited primarily to smaller ships and barges, resulting in higher transportation costs. More and more ships would be forced to wait for favorable tides or wait for other ships to clear the entrance channel. These ship delays would lead to related economic losses. Larger vessels would be forced to lighter (offload) in Long Island Sound or be rerouted to other ports having deeper channels. In either case, transportation costs would rise, which would have to be passed on to consumers.

The demand for recreational boating, under the without-project condition, is expected to remain. Presently, there are long waiting lists for slips, and moorings throughout the study area, and this demand could be expected to increase under the without-project condition.

WITH-PROJECT CONDITION

Bridgeport harbor has not been used to its full potential. Such is the case at Bridgeport, because of a variety of factors. While the size of deep-draft vessels had been increasing during the 1960's and 1970's, the hazard of inadequate deepwater maneuvering area has limited the size of fully loaded or partially loaded vessels visiting the harbor. Partial loading and lightering of vessels has been common, resulting in increased unit transportation costs.

Because of recent recession conditions, high interest rates and the present worldwide glut of oil, Bridgeport terminals have not been used to their highest potential. Due to the high cost of borrowing, oil and dry-cargo receivers have preferred to keep their inventories lower and order smaller loads of oil and other commodities. This condition is documented by a 10 percent increase in the number of vessels visiting Bridgeport in 1981, as compared with 1980 vessel trips, plus a noticeable decrease in the size of vessels visiting Bridgeport. It is anticipated that long-term worldwide economic conditions will improve, causing the present oil glut to be greatly reduced or eliminated. As older smaller tankers wear out, more efficient (heavier loading) of larger vessels can be expected.

However, existing conditions will not necessarily continue for the next 5, 10 or 20 years. Because of continuing pressures to reduce shipping costs (costs per ton), more efficient use of the harbor can be expected over the long term. Although the harbor may not be used to its maximum potential if channel deepening and maneuvering area improvements are made at Bridgeport, the fleet would shift over time to the use of larger vessels and more efficient use of harbor facilities. It is acknowledged that other factors, such as the cost of fuel from various sources, prevailing interest rates, product availability, vessel availability, foreign fuel import taxes, storage capacity and other factors are likely

to have significant impact on the choice of transportation. A deeper channel at Bridgeport increases the flexibility that users have to select among various options for product delivery.

In order to address risk and uncertainty in the benefit analysis, two sensitivity analyses were made during the study. One scenario computed project benefits through holding anticipated 1985 tonnage constant over the 50-year project life (taken as 1990-2040). The second scenario entailed holding projected 1990 fleet characteristics constant and allowing tonnage to increase moderately over the 50-year project life (1990-2040). The traditional economic analysis, based on Bridgeport shipping industry projections that tonnage (oil, coil and dry cargos) would increase moderately and that vessel sizes would increase over the 50-year project life (1990-2040), has been selected as representing the most probable future condition following project implementation.

PROBLEMS AND OPPORTUNITIES

Information used to identify specific problems and needs was obtained from city officials at a meeting held on 14 August 1984 at Bridgeport. Conversations with the officials determined that commercial navigation in Bridgeport Harbor was the main concern. Although the following areas were addressed, the alternative plans considered the problems in the main harbor. Also, past discussions with the local users were helpful in formulating plans for Bridgeport Main Harbor.

Ash Creek

Shoal areas previously existed in the 60-foot-wide, 6-foot-deep entrance channel dredged by the town in the lower reach of Ash Creek. Tidal delays were experienced by deeper draft sailboats berthed at the municipally owned marina at the west side of the creek near the head of the entrance channel. This problem was resolved when a 9-foot-deep channel was dredged by the town in 1981.

Black Rock Harbor

Black Rock Harbor has three major problems. Shoaling has occurred in the authorized 18-foot channel leading to Cedar Creek. This has required that 18-foot-draft tugboats, assisting oil barges to the upper reaches of Cedar Creek, slow down or stop because the barges scrape bottom or churn up silt at lower stages of the tide. This causes delays and maneuvering problems, as well as interruption of recreational boating activity in the lower harbor area during the sailing season. Approximately 1,000 pleasure boats moor along the Black Rock Channel during the summer months.

The fuel oil terminals in the upper reaches of Cedar Creek supply a large percentage of the homes and businesses in the Greater Bridgeport area. The deliveries required to keep these terminals supplied have been

increasing and are expected to be more frequent in the future. The harbormaster has suggested deepening the channel to 22 feet, so as to allow tugs to pass safely through the channel with reasonable clearance for future siltation of the bottom.

A second major problem is the lack of protection from wave action in the outer harbor, particularly during storms generated across Long Island Sound. Damage to the boats moored in the harbor and shorefront facilities from severe storms has run into thousands of dollars. Local interests feel that breakwaters are needed at the entrance. This problem was studied in conjunction with the need for anchorage areas in Black Rock Harbor.

A third identified problem in Black Rock Harbor area is the lack of sufficient anchorage. Cedar and Burr Creeks are well protected and would make fine mooring areas. A few small boats currently anchor there but are grounded at low tide. Local interests desire mooring basins in this area as the demand for recreational boating is very high and mooring space is needed.

Existing yacht clubs along the harbor have large sailing fleets, and their boats are encroaching on the existing channel. The yacht clubs have also expressed the need for anchorages on both sides of the channel in the lower Black Rock Harbor area.

Bridgeport Main Harbor

Bridgeport Harbor has two major problems - insufficient depth and insufficient turning basin area. Both problems are presently generated by the functions of the three largest terminals in the harbor, the United Illuminating (U.I.) Company Tongue Point powerplant, the Cilco cargo terminal and the Shell Oil terminal.

Channel depth. The present channel depth is limiting the size of vessels that can enter the port. Although 34-foot-draft vessels occasionally visit the Cilco and Shell Oil terminals, 32-foot-draft tankers are the largest vessels that visit the U.I. terminal. Some vessels have to wait up to 6 hours for favorable tides. While ship pilots try to take advantage of the 6.8-foot range of tide, some shoaling has occurred in the outer channel, narrowing the effective channel width to 200 feet, and negating some of the favorable range of tide. Another controlling factor in safe passage of vessels is that U.S. - flag ships usually require a minimum clearance of 4 feet under the keel, while some foreign ships require a 6-foot clearance under the keel. Because of these conditions, some ships experience difficulty in navigating the 35-foot project, and others are forced to transport petroleum or dry-bulk cargos in smaller barges in Long Island Sound.

U.S. flag and foreign fleets are increasing in vessel size. Over 80 percent of the Bridgeport petroleum tonnage is carried in foreign flag

tankers, which tend to draw 2 or 3 more feet than U.S. tankers. Deepening of the channel would permit tankers in the 60-to 70,000 deadweight ton range, which draw between 40 and 43 feet, to use the port. In previous years, some tankers in this range have transited the channel with reduced loads.

Turning basin. At present, U.I. cannot accommodate large fully loaded tankers at their offloading facility at Tongue Point. Because of the existing 35-foot depth restriction in the channel and the existing turning basin is located inshore of Tongue Point, larger tankers must be scheduled to enter the harbor three quarters to half full, or with a loaded draft of only 32 feet. This causes problems with scheduling and requires more frequent tanker deliveries to supply the oil-fired generating station. Tankers preparing to dock at Tongue Point, which requires a sharp turn to port (left), have run aground on two occasions. Fortunately, neither incident resulted in an oil spill.

Larger cargo ships visiting the Cilco terminal, which must also make a turn to port, also experience docking problems because of insufficient turning area and insufficient depth in the existing turning basin. Some shoaling has occurred in the middle third of the turning basin, causing controlling depths of 32 feet. Shell Oil has shifted in recent years to use of barges for transferring distillate fuel oil and gasoline from its Texas-New Jersey pipeline to its Bridgeport terminal, rather than by previous tanker shipments from Houston, Texas. Harbor pilots have reported difficulties in maneuvering larger size vessels to the Cilco and U.I. terminals. Owners of both firms have requested that the turning basin be enlarged and deepened. With the world trend toward larger vessels, present problems will worsen. The New Haven-Bridgeport Harbor Pilots Association has requested that the existing 25-foot anchorage, which is located immediately south (or seaward) of the turning basin be made part of the turning basin. With this added area, larger vessels (70,000 DWT) in the 800-foot-long range could be handled with an acceptable degree of safety.

Another identified problem is the inadequate depth at the city-owned Union Square Dock at the western head of the harbor. During recent visits by foreign sailing vessels and U.S. Navy and Coast Guard ships, the city secured a barge to the dock so that vessels could remain in deeper water near the channel. The Mayor requested that 1.5-acre docking area be dredged so that future visiting vessels could tie-up directly to the dock.

Pequonnock River

Local interests requested that a 100-boat municipal marina be developed along the Jai Alai Fronton parking area in the lower reach of the river. No specific request for channel improvements was received from the Hoffman Fuel Company (Chevron), which operates the only active commercial terminal along the river.

Yellow Mill Channel

Two requests were received concerning Yellow Mill Channel, one for removal of a sunken barge in front of the Move Yacht Club near the channel entrance, and the second for filling the upper channel with dredged material.

Johnsons Creek

Members of the Miaogue Yacht Club requested that a 3-acre anchorage be dredged for use by recreational boats in a small cove at the northwest side of the creek.

Other Needs

Other needs expressed included placement of suitable dredged materials on the beaches at Seaside Park and Pleasure Beach, extension of the main harbor west breakwater to the shore so that sportfishermen would not be stranded by rising tides, development of an offshore pipeline terminal for petroleum products, and consideration of upland disposal areas (where appropriate) in lieu of deepwater disposal of dredged materials.

PLAN FORMULATION RATIONALE

Selection of a specific plan for Bridgeport Harbor and vicinity contingent upon technical, economic and environmental criteria that would permit an objective appraisal of the impacts and feasibility of alternative solutions.

Technical criteria require that the optimum plan have facilities and dimensions adequate to accommodate expected user vessels as well as adequate areas for maneuvering of vessels and development of associated shore facilities. Project dimensions should provide adequate separation from the shoreline so that dredging would not impact on shoreline stability or require shore protection measures.

Economic criteria require that tangible benefits exceed economic costs and that the project scope provide maximum net benefits and minimize adverse impacts on existing, adjacent operations.

Environmental criteria require that the plan minimize alteration of intertidal areas, minimize volume of dredged material to reduce disposal problems, be environmentally and socially acceptable, and incorporate measures to enhance and protect the environmental quality of the area. The plan should be aesthetically compatible if structures are involved, minimize both social and environmental impacts, and entail use of sources of expertise to identify endangered species of marine life or areas of historical significance.

In view of the deactivation of the United Illuminating Steel Point powerplant and the unlikelihood that a prospective industrial firm requiring deepwater access would occupy the site in the short-term, the confluence of the Yellow Mill Channel with the main ship channel was used as the upper limit for all channel deepening proposals for the main harbor.

DESCRIPTION OF PLANS FOR PROJECT OPTIMIZATION

The four plans detailed in this section addressed the main concerns for Bridgeport Harbor and vicinity. These plans addressed to different degrees the need for more efficient access to the commercial terminals in Bridgeport Harbor. All plans call for disposal of dredged material in the Central Long Island Sound Regional Disposal Area, about 15 miles east of the Bridgeport main ship channel. Recreational alternatives were considered but are minor in respect to the main harbor improvements. Discussion with local officials focused primarily on commercial navigation.

The first costs have been estimated for the following four plans of improvement. Investment costs were also computed by adding the cost of interest during construction. The estimates of annual costs are based on a 50-year project life and an interest rate of 8 1/8 percent. Annual costs include expenditures for annual maintenance dredging required for incremental channel dimensions. Costs of reconstruction of bulkheads and dredging of private berths are also estimated and included in project costs.

Plans A through D that follow all entail retaining a 400-foot channel width. Because past overdredging of the channel width has occurred, oyster industry officials are concerned that additional top-of-slope oyster harvesting grounds would be lost if the existing 400-foot-wide channel is deepened. Although 4 to 5 acres of oyster grounds could be lost if excessive overdredging should occur with a 41-or-42-foot-deep channel, because the existing channel transects one-half mile of productive oyster beds, the dangers of an oil spill would increase significantly should a narrower channel width be imposed.

All of the larger tankers visiting Bridgeport Harbor, of which 80 percent are tankers in the 20,000 to 50,000-DWT range, require exclusive one-way use of the existing channel for safe transit. The New Haven-Bridgeport Pilots Association has expressed concern that frequent groundings and attendant oil spills could be expected if the existing channel width is decreased. For this reason, a 400-foot channel width has been retained, so as to protect the overall environment of the area.

Plan A

Bridgeport Harbor

Provides for deepening the existing 35-foot channel to 38 feet upstream to Yellow Mill Channel, deepening the existing turning basin to

38 feet, and enlarging the turning basin by deepening 10 acres of the existing 25-foot anchorage to 38 feet. This would permit larger tankers, barges and cargo vessels to reach all three major terminals in the main harbor. It requires removal of 1,240,000 cubic yards of organic and inorganic silt, gravelly to silty sand, and clay, plus extension of the channel about 1,100 feet seaward.

	<u>Amount</u>
Dredging 1,240,000 c.y. @ \$4.35/C.Y.	\$5,394,000
Contingencies (25%)	\$1,348,500
Construction Cost	\$6,742,500
Engineering and Design (4%)	\$ 269,750
Supervision and Administration (4%)	\$ 269,750
Subtotal:	\$7,282,000
Enlarging Private Berths	\$1,100,000
Navigation Aids	\$ 6,000
<u>Total First Cost of Element</u>	<u>\$8,388,000</u>
Interest During Construction (5 months)	\$ 168,000
<u>Total Estimated Project Investment</u>	<u>\$8,556,000</u>
<u>Annual Charges</u>	
Total Project Investment \$8,556,000	
Interest & Amortization (8 1/8% 50 yrs)	\$710,000
Annual Maintenance (1% per year)	\$ 86,000
<u>Total Annual Cost of Element</u>	<u>\$796,000</u>

PLAN B

Bridgeport Harbor

Provides for deepening the existing 35-foot channel to 40 feet upstream to Yellow Mill Channel, deepening the existing turning basin to 40 feet, and enlarging the turning basin by deepening 10 acres of the existing 25-foot anchorage to 40 feet. It requires extending the channel 2,300 feet seaward and removal of 1,710,000 cubic yards of organic and organic silts, silty to gravelly sands, and clay.

	<u>Amount</u>
Dredging 1,710,000 c.y. @\$4.30/C.Y.	\$7,353,000
Contingencies (25%)	\$1,838,300
Construction Cost	\$9,191,300
Engineering and Design (4%)	\$ 367,700
Supervision and Administration (4%)	\$ 367,700
Subtotal:	\$9,926,700
Enlarging Private Berths	\$1,540,000
Navigation Aids	\$ 10,000
<u>Total First Cost of Element</u>	<u>\$11,477,000</u>
Interest During Construction (6 months)	\$ 230,000
<u>Total Estimated Project Investment</u>	<u>\$11,707,000</u>

Annual Charges

Total Project Investment	\$11,707,000	
Interest & Amortization (8 1/8%, 50 yrs)		\$ 971,000
Annual Maintenance (1% per yr)		\$ 117,000
<u>Total Annual Cost of Element</u>		<u>\$1,088,000</u>

PLAN CBridgeport Harbor

Provides for deepening the existing 35-foot channel to 41 feet upstream to Yellow Mill Channel, deepening the existing turning basin to 41 feet, and enlarging the turning basin by deepening 10 acres of the existing 25-foot anchorage to 41 feet. It entails removal of 2,000,000 cubic yards of organic and inorganic silts, silty to gravelly sands, and clay, as well as extension of the channel 2,600 feet seaward.

	Amount
Dredging 2,000,000 c.y. @\$4.30/C.Y.	\$ 8,600,000
Contingencies (25%)	\$ 2,150,000
Construction Cost	\$10,750,000
Engineering and Design (3%)	\$ 322,500
Supervision and Administration (4%)	\$ 430,000
Subtotal:	\$11,502,500
Enlarging Private Berths	\$ 1,870,000
Navigation Aids	\$ 10,000
<u>Total First Cost of Element</u>	<u>\$13,303,000</u>
Interest During Construction (7 months)	\$ 268,000
<u>Total Estimated Project Investment</u>	<u>\$13,651,000</u>
<u>Annual Charges</u>	
Total Project Investment	\$13,651,000
Interest & Amortization (8 1/8%, 50 yrs)	\$ 1,132,000
Annual Maintenance (1% per year)	\$ 136,000
<u>Total Annual Cost of Element</u>	<u>\$ 1,268,000</u>

PLAN DBridgeport Harbor

Provides for deepening the existing 35-foot channel to 42 feet upstream to Yellow Mill Channel, deepening the existing turning basin to 42 feet, and enlarging the turning basin by deepening 10 acres of the existing 25-foot anchorage to 42 feet. It would require removal of 2,620,000 cubic yards of organic and inorganic silts, silty to gravelly sands, and clay, plus extension of the channel 2,900 feet seaward.

	<u>Amount</u>
Dredging 2,620,000 c.y. @\$4.25/C.Y.	\$11,135,000
Contingencies (20%)	\$ 2,227,000
Construction Cost	\$13,362,000
Engineering and Design (3%)	\$ 401,000
Supervision and Administration (4%)	\$ 535,000
Subtotal:	\$14,298,000
Enlarging Private Berths	\$ 2,200,000
Navigation Aids	\$ 10,000
<u>Total First Cost of Element</u>	<u>\$16,508,000</u>
Interest During Construction (8 months)	\$ 495,000
<u>Total Estimated Project Investment</u>	<u>\$17,003,000</u>
<u>Annual Charges</u>	
Total Project Investment \$17,003,000	
Interest & Amortization (8 1/8%, 50 yrs)	\$ 1,410,000
Annual Maintenance (1% per year)	\$ 170,000
<u>Total Annual Cost of Element</u>	<u>\$ 1,580,000</u>

ESTIMATE OF BENEFITS

The economic justification of the proposed improvements to Bridgeport Harbor is determined by comparing the average annual benefits accruing to the project over its economic lifespan to the equivalent annual costs. Benefits and costs are compared by putting them on an average annual basis using the interest rate of 8 1/8 percent currently applicable to Federal projects. The economic life of the project is 50 years from 1990 to 2040.

The proposed project would accrue deep draft navigation commercial benefits derived from projected savings in the cost of transporting petroleum products on the improved waterway. They would arise through the use of larger vessels to obtain efficiencies of scale and reduced transportation costs. More efficient use of existing vessels would also occur due to reductions in tidal delays, lightering and the necessity for multiport operations.

Also of concern is how the dredging operations associated with the deepening of the harbor would affect the oyster industry. Oyster beds, located along the main ship channel in Bridgeport Harbor are likely to be impacted by the proposed improvements.

Improved safety, though not directly quantifiable, would also be a significant benefit. The risk of collisions and/or groundings is partially dependent on the density of traffic. Deepening the channel would enable larger vessels to make fewer total trips, thus decreasing traffic and improving safety. The deepening would also allow vessels which currently must move within a few hours of high tide to use the waterway 24 hours a day, thereby reducing peak hour congestion.

By allowing for safer passage of ships and barges, deepening would also result in a reduction in the risk of a major pollution incident

occurring. By decreasing the need for existing vessels to engage in tanker-to-barge lightering operations, the proposed project would further minimize the potential for oil spills. The prevention of a pollution event involving oil or chemicals could mean saving millions of dollars in cleaning costs and lost income to the oyster industry. (Although the use of larger vessels would reduce the expected frequency of an oil spill, the expected magnitude of the spill could increase.)

Commercial Benefits

United Illuminating Company (UI) is the only user to presently benefit from the deepening of Bridgeport Harbor. UI imports residual oil for the generation of electric power at its Tongue Point plant along the main harbor. Currently, oil is being purchased on the spot market in Europe and in the Carribean, and is shipped to Bridgeport via tankers. Discussions with UI in the Spring of 1984 indicated that its residual needs will decrease by 25% from 1,330,000 to 1,000,000 short tons in 1985 and due to the conversion of its electrical generating unit 3 to coal. The continuing use of oil for units 1 and 2 would require a slight annual increase estimated at approximately 0.5 percent per year to 1,025,000 short tons in 1990 and thereafter remain for the life of the project to 2040. The deepening of the harbor will permit the use of larger vessels to obtain efficiencies of scale and reduced transportation costs. Transportation costs have been calculated for the projected fleet mixes serving UI at various channel depths from 38 to 42 feet. The benefits are the difference between transportation cost on the present 35 foot deep channel, and those at the various alternative channel depths under consideration.

Depth of Channel

38 feet	\$ 376,000*
40 feet	\$1,755,000*
41 feet	\$1,817,000*
42 feet	\$1,878,000*

*See the following discussion on oyster industry effects

Effects on the Oyster Industry

A major consideration in this study was how project implementation would affect the oyster industry at the project site. The existing entrance channel to Bridgeport Harbor transects approximately one half mile of oyster beds. Dredging the main channel a depth of 42 feet plus a 2 foot overdepth would result in a total loss of approximately 4.6 acres of oyster harvesting grounds. Assuming a worst case condition i.e. that all oyster beds are being used to full capacity and that a decline in production would result from project implementation, approximately 5,000 bushels per acre for 4.6 acres in the main channel would result in annual losses of \$110,400.

Comparison of Benefits and Costs

Contribution to the National Economic development is measured by comparing the project's annual benefits and costs as a ratio. If the benefit/cost ratio (BCR) is greater than or equal to 1.0, the project is considered to have a net positive effect on the national economic development.

TABLE 3
Economic Justification For
Bridgeport Harbor, Connecticut

Plan	Project Depth(ft)	Average Equivalent Annual Benefits	Average Equivalent Annual Costs	Benefit Cost Ratio	Net Average Equivalent Annual Benefits
A	38	376,000*	796,000	0.47	-----
B	40	1,755,000*	1,088,000	1.61	667,000
C	41	1,817,000*	1,268,000	1.43	549,000
D	42	1,878,000*	1,580,000	1.19	299,000

* Reflects lost oyster industry income of \$110,400.

ASSESSMENT AND EVALUATION OF DETAILED PLANS

The plan selected for implementation is the plan that would best meet the technical, economic and environmental objectives by meeting the area's needs, maximize net benefits, minimize adverse impacts and protect the environmental quality of the area. Plan B (the 40-foot channel) in Bridgeport Harbor has been selected as the recommended plan for the following reasons:

a. Plan B is incrementally justified and provides maximum net benefits. This plan provides maximum contributions to the national economic development, as well as minimizes the impacts on the project environment.

b. The selected plan meets the area's needs. While the 42-foot-draft proposal would provide a slightly greater margin of safety, Plan B would meet the needs of most deep-draft vessels expected to use the harbor. Most vessels would be in the 30-to 39-foot range based on 80 percent of present tonnage being carried in foreign flag tankers. Infrequent larger tankers in the 60- to 70,000-DWT range (loaded drafts of 43-44 feet) would be able to navigate the channel at normal high tide conditions.

c. The selected plan protects the environmental quality of the area through proposed use of clamshell dredges and special constraints on

dredging operations and specific dredging season. This plan element would result in removal of organic silt near the head of Bridgeport Harbor which would be point-dumped and capped at the Central Long Island Sound Regional Disposal Area by heavier sandy material obtained from within the outer limits of the ship channel.

THE SELECTED PLAN

Description

Plan B best solves the commercial navigation problems in the Bridgeport area. Its selection is supported by technical analysis and by local interest. The plan, as shown in Figure 3 consists of the following improvements:

- o Deepening the existing 35-foot-deep main ship channel to a depth of 40 feet at mean low water (while retaining the existing 400-foot channel width;
- o Enlarging the existing 35-foot-deep turning basin to 28 acres and deepening to 40 feet;
- o Designating an additional 10 acres (now exceeding 25 feet in depth) to restore the 25-foot anchorage to its full 23-acre dimensions.

Plan Accomplishments

The selected plan of improvement addresses the major need facing Bridgeport Harbor, namely accomodating larger commercial vessels for Bridgeport Harbor. The plan meets the federal objective of providing the maximum net economic benefits and constitutes the National Economic Development plan. The selected plan meets all of the regional and local planning objectives and stresses specific areas where special precautions must be taken to minimize any impacts associated with dredging or disposal of dredged materials.

PLAN IMPLEMENTATION

Cost Allocation

The first cost of the selected general navigation facilities in Plan B (40-foot channel and turning basin), based on June 1984 price levels, is estimated at \$9,927,000, excluding private berth improvements estimated at \$1,540,000 and navigation aids estimated at \$10,000. The estimated \$9,927,000 dredging cost of the main harbor channel and turning basin and improvements would be fully reimbursed by local interests under current Department of the Army policy. Previously, the full cost of general navigation facilities for commercial navigation was borne by the federal government under the traditional cost-sharing policies. Private shipping

interests would be required to provide berthing depths commensurate with project depth, presently estimated at \$1,540,000. The allocation of project costs is summarized in Table 4, Summary of Cost Apportionment, excluding the cost of navigation aids.

TABLE 4

Selected Plan
Summary of Cost Apportionment

Present Department of the Army Cost-Sharing Policy

	Type of Improvement		
	<u>Commercial</u>	<u>Private</u>	<u>Totals</u>
Federal	----	---	---
Non-Federal	\$9,927,000	\$1,540,000	\$11,467,000
Totals	<u>\$9,927,000</u>	<u>\$1,540,000</u>	<u>\$11,467,000</u>

Traditional Cost-Sharing Policy

	Type of Improvement		
	<u>Commercial</u>	<u>Private</u>	<u>Totals</u>
Federal	\$9,927,000	---	\$ 9,927,000
Non-Federal	---	\$1,540,000	\$ 1,540,000
Totals	<u>\$9,927,000</u>	<u>\$1,540,000</u>	<u>\$11,467,000</u>

Cost-sharing policies are discussed in the next section, entitled "Division of Plan Responsibilities".

Division of Plan Responsibilities

Federal Responsibility. Following Congressional authorization and funding, the Corps of Engineers would design and prepare detailed plans for the general navigation facilities. After receipt of local assurances including cost-sharing arrangements, the Corps of Engineers would construct the authorized improvements and the U.S. Coast Guard would provide the necessary aids to navigation. Future federal maintenance dredging of the authorized project would be dependent upon future needs and the extent of future usage, i.e., the size and frequency of vessels using the project.

Non-Federal Responsibility. Local interests would provide all lands, easements and rights-of-way for implementation and maintenance of the project, and provide berth improvements commensurate with the project depth. Letters of assurance would be required from the State of Connecticut and the city of Bridgeport, including cost-sharing

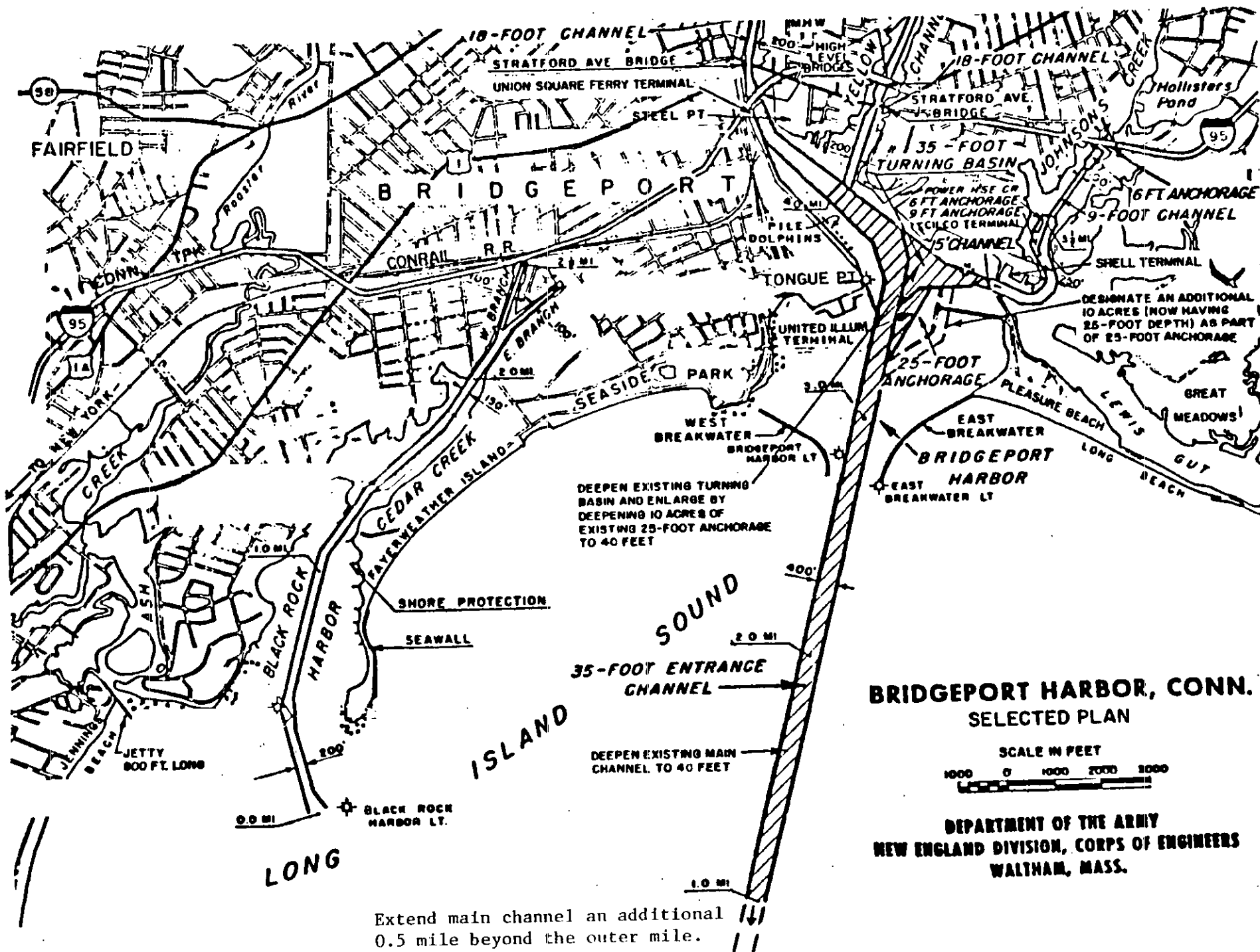


FIGURE 3

arrangements, indicating their willingness and ability to participate in the project and fulfill the conditions of local cooperation, as noted in the "Recommendations" section which follows.

On July 15, 1981, the Department of the Army, on behalf of the Administration, transmitted proposed legislation to Congress that would provide for full recovery of certain operation, maintenance and construction of rehabilitation costs for deep draft channels and ports with authorized depths greater than 14 feet. Under this proposed legislation, Corps of Engineers expenditures for the Bridgeport Harbor Deep Draft Navigation Project would be subject to recovery. Accordingly, non-federal interests would be required to reimburse the federal government for construction of navigation features of the recommended plan, and all subsequent expenditures for operation, maintenance and rehabilitation; except for expenditures assigned by the Secretary of the Army for national defense transportation requirements and to governmental vessels in noncommercial service.

The entire amount of the federal construction or rehabilitation expenditures to be reimbursed, including interest during construction and interest on the unpaid balance, would be reimbursed within the life of the project, but in no event to exceed 50 years after the date the project becomes available for use. The interest rate for reimbursement purposes would be determined by the Secretary of the Treasury based on the average market yields on outstanding obligations of the United States. Reimbursements for operation and maintenance would be made annually, and may be scheduled and periodically adjusted to result in the payment of actual operation and maintenance costs. The sponsoring public body would be authorized by the collection of fees for the use of the project by vessels in commercial waterway transportation.

Under the Department of the Army's current innovative financing policy, local interests would be required to contribute \$7,450,000 (75 percent of the commercial navigation improvement) toward project construction and agree to subsequent reimbursement of \$2,480,000 (25 percent of the commercial navigation improvement cost) over the economic life of the project (50 years).

CONCLUSIONS

In today's volatile market, the conditions make it unnecessary for oil handlers to be concerned with storage of petroleum in large amounts. Falling prices among competitors dictate that more flexibility of these large shipments for cost savings is less important and therefore the competitors are stockpiling less reserves.

The high cost of money (interest rates) effects the profit margin and this also works against stockpiling oil reserves by making it difficult for the oil handlers to borrow money.

These issues have drastically shifted in the last decade and may shift in the next decade depending upon the oil market and interest rates.

RECOMMENDATIONS

I have reviewed and evaluated in light of the overall public interest, the information contained in this report concerning deep draft navigation in Bridgeport Harbor. I have considered the views of local, state and other federal officials, other agencies, organizations, harbor users, and other concerned members of the public. The possible consequences of constructing the selected plan, as well as each of the alternatives, were studied and evaluated for environmental effects, social effects, engineering considerations and economic factors. Special attention was given to attaining waterborne transportation savings and increasing the safety of deep draft navigation in the harbor.

The evaluation was made provided that, except as otherwise provided in these recommendations, the exact amount of nonfederal contributions shall be determined by the Chief of Engineers prior to project implementation, in accordance with the following requirements to which non-Federal interests must agree prior to implementation:

a. Provide, without cost to the United States, all lands, easements and rights-of-way necessary for implementation and later maintenance of the project and for aids to navigation, upon the request of the Chief of Engineers. In the event that the Central Long Island Sound Regional Disposal Area is not available for the disposal of dredged material associated with improvement or maintenance dredging, non-Federal interest would agree to provide suitable alternative disposal areas or sites determined by the Chief of Engineers to be in the general public interest for initial and later disposal of dredged material, and including necessary retaining dikes, bulkheads and embankments thereof, or the costs of such retaining works.

b. Hold and save the United States free from damages due to implementation and maintenance of the project, not including damages due to fault or negligence of the United States or its contractors;

c. Provide and maintain without cost to the United States adequate terminal and transfer facilities open to all on equal terms;

d. Provide and maintain without cost to the United States adequate depths in berthing areas serving the terminals;

e. Accomplish without cost to the United States all alterations and relocations of transportation facilities, storm drains, sewer outfalls, utilities, and other structures and improvements made necessary by the project;

f. Prohibit the erection of any structure within a distance to be determined by the Chief of Engineers from the bottom edge of the project channel, turning basin and mooring basin areas.

g. Reimburse the federal government in accordance with the Administration's July 15, 1981 proposed legislation for expenditures for the construction of the general navigation facilities of the recommended plan, and subsequent expenditures for operation, maintenance and rehabilitation; except for expenditures assigned by the Secretary of the Army for national defense transportation requirements.

I find that navigation improvements to Bridgeport Harbor and vicinity are economically feasible, but that in view of today's world oil glut, interest rates, and local assurance requirements as stated above not being met by the non-Federal interests, I conclude that it would be in the best interest of the United States and the non-Federal interests to defer this project from active status at this time.

Carl B. Sciple
Colonel, Corps of Engineers
Division Engineer

ACKNOWLEDGEMENT AND INDENTIFICATION OF PERSONNEL

This report was prepared under the supervision and management of the following New England Division personnel:

Colonel Carl B. Sciple, Division Engineer.
Joseph L. Ignazio, Chief, ,Planning Division
John T. Smith, Chief, Coastal Development Branch
Richard J. DeSimone, Chief, Navigation Section

The study and the report was prepared under the direction of James G. Doucakis, Project Manager. Steve Rubin and Charles Joyce prepared the economic material; Diana Halas prepared the socioeconomic conditions; and Anthony Riccio and William Coleman prepared the engineering and price estimates.

The New England Division is appreciative of the assistance received from individuals and local, municipal, State and Federal authorities, particularly the following individuals:

Leonard S. Paoletta, Bridgeport Mayor
John C. Mandanici, Former Bridgeport Mayor
James A. Crispino, Bridgeport Planning Director
Gilbert Zawadski, Bridgeport Harbormaster
Captain Donald V. Monks, NewHaven-Bridgeport Pilots Association
Mike Nidoh, Bridgeport Planning Department.

APPENDIX 1
PERTINENT CORRESPONDENCE



OFFICE OF THE MAYOR
CITY OF BRIDGEPORT, CONNECTICUT
45 LYON TERRACE
BRIDGEPORT, CONNECTICUT 06604

LEONARD S. PAOLETTA
Mayor

November 22, 1982

Mr. Joseph L. Ignazio
Chief: Planning Division
Department of the Army
Corps of Engineers, NED
424 Trapelo Road
Waltham, Ma. 02254

Dear Mr. Ignazio:

At the Workshop Meeting on navigational improvements to Bridgeport Harbor, held at the Miamogue Yacht Club on May 27, 1982, the Commodore of the yacht club stated that the proposed 3-acre anchorage in Johnsons Creek would be located too far away from the Miamogue and East End yacht clubs. Both of these clubs, which are located on the creek, have indicated that the proposed anchorage would not be used by their members for this reason.

Acting upon the request of Mr. Steve Onysko, your Project Manager for the Bridgeport study, we took another look at the future needs and desires of local boating interests on Johnsons Creek. At this time, we can foresee no future need for this type of anchorage at this location. It is apparent from our discussions with the yacht clubs in this area that floating slips are preferable to remote moorings away from the club facilities. In addition, with no direct access to the proposed anchorage, only a limited number of recreational boaters would use the facility and thus, full capacity of the anchorage would probably never be attained.

Therefore, it is recommended at this time that the proposed 3-acre anchorage in Johnsons Creek be dropped from any alternative navigational improvement plan now under study.

If I can be of any further assistance in this matter, please let me know.

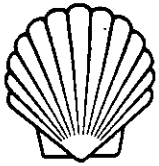
Sincerely,

A handwritten signature in dark ink, appearing to read "Leonard S. Paoletta", is written over the word "Sincerely,".

Leonard S. Paoletta,
Mayor

LSP/pv

cc: Gilbert Zawadski - Harbormaster



SHELL OIL COMPANY

EAGLES NEST ROAD
P. O. BOX 4127
BRIDGEPORT, CONNECTICUT 06607

December 21, 1982

Joseph L. Ignazio
Chief, Planning Division
New England Division
Corps of Engineers
424 Trapelo Road
Waltham, Mass. 02254

Dear Mr. Ignazio:

In reply to your letter of November 5, 1982 concerning a feasibility study for possible dredging of the Bridgeport Harbor we have reviewed our future needs in this area. At this time we wish to advise you that Shell Oil Co. has no interest in this project.

Very truly yours,

R.R. Johann
Plant Manager



LEONARD S. PAOLETTA

Mayor

OFFICE OF THE MAYOR
CITY OF BRIDGEPORT, CONNECTICUT

45 LYON TERRACE
BRIDGEPORT, CONNECTICUT 06604

December 27, 1982

Mr. Joseph L. Ignazio
Chief, Planning Division
Department of the Army
New England Division, Corps of Engineers
424 Trapelo Road
Waltham, Mass. 02254

Dear Mr. Ignazio:

The Corp of Engineers and the City of Bridgeport have for several years now been actively discussing the potential improvements to the navigable harbors of Bridgeport. One of Bridgeport's greatest assets is its shoreline with its many water-dependant activities for both recreational and commercial interests. The City acknowledges the Corp's proposed navigational improvements for Bridgeport Harbor and vicinity as a definite step forward in expanding the City's capabilities in the area of water-related uses.

It is the intention of the City of Bridgeport to participate in the recommended improvements contained in your study, assuming the availability of resources to fulfill the local match requirement. We are excited about your suggestions and support the continuation of the present study.

If at any time the City of Bridgeport can provide your office with any additional information, please do not hesitate to contact my office at (203) 576-7201.

Sincerely,

A handwritten signature in dark ink, appearing to read "Leonard S. Paoletta", is written over a circular stamp that partially overlaps the "Sincerely," text.

Leonard S. Paoletta, Mayor
City of Bridgeport

LSP/MPN/pv

UI United Illuminating

General Offices: 80 Temple Street

P.O. Box 1564, New Haven, Conn. 06506-0901

January 4, 1983

Mr. Joseph L. Ignazio
Chief, Planning Division
Department of the Army
New England Division
Corps of Engineers
424 Trapelo Road
Waltham, Massachusetts 02254

RE: Your Letter Of November 5, 1982
Soliciting Interest In The Bridgeport Harbor And
Vicinity Feasibility Study For Navigational Improvements

Dear Mr. Ignazio:

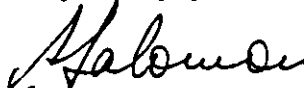
The concept of deepening the Bridgeport Harbor navigational facilities to handle 40 foot draft marine traffic does not contain enough economic incentive for The United Illuminating Company to pursue an interest at this time.

The United Illuminating Company feels that, at this time, the existing 36 foot draft facilities and their continued maintenance provide sufficient capacity for our needs.

Since your project is scheduled for the late 1980s and since the value of deep drafts is difficult for UI to forecast, we certainly have a continuing interest in this plan and its development.

Your continuing efforts to keep us informed are greatly appreciated. Please continue this practice in the future.

Very truly yours,



John H. Salomon
Superintendent of Production

JHS/es

The United Illuminating Company
an investor-owned electric light and power company

CILCO TERMINAL COMPANY, inc.

BRIDGEPORT, CONNECTICUT 06601

TERMINAL OPERATORS — STEVEDORES — STEAMSHIP AGENTS

MAIN OFFICE: 75 THIRD STREET

P.O. BOX 510

TERMINAL & OPERATIONS: 535 SEAVIEW AVENUE

PHONE: (203) 336-3841

TWX: 7104534028

TLX: 964343

CABLE ADDRESS: CILCO

January 19, 1983

Mr. Joseph L. Ignazio
Chief, Planning Division
Department of the Army
New England Division
Corps of Engineers
424 Trapelo Road
Waltham, Mass. 02254

Attention: NEDPL-C


Dear Sir:

This is in response to your letter of November 3, 1982, in which you ask for a letter of continued interest in the dredging of the harbor at Bridgeport to 40 feet below mean low water. You further tell us that it is estimated that 27,000 cubic yards would need to be dredged at our terminal.

The construction of our terminal does not permit dredging below 35 feet. Any dredging below this would endanger the construction of our facility. We would not be involved in a deepening beyond 35 feet.

Sincerely yours,

CILCO TERMINAL COMPANY, INC.


Sidney S. Postol
Vice President

ssp/fm



State of Connecticut

Department of Environmental Protection



Stanley J. Pac
Commissioner

State Office Building

Hartford, Connecticut 06106

August 26, 1983

Colonel Carl B. Sciple
Department of the Army
New England Division
Corps of Engineers
424 Trapelo Road
Waltham, Massachusetts 02254

Dear Colonel Sciple:

It has come to my attention that you are soon to send a draft feasibility report on Bridgeport Harbor to your Washington office for preliminary review. Let me state that Connecticut supports all reasonable attempts to keep Bridgeport Harbor and its other ports competitive.

The role of the New England Division in continuing to improve and maintain our ports along with our smaller waterways and harbors is important to Connecticut's competitive posture in interstate and world trade markets. Your continued initiatives appear more necessary now than ever in these days with proposals for significant user fees and local cost sharing reported daily in news articles. Without your continued cooperation and financial support, our ports systems would surely deteriorate.

I understand that the project improvements which would enhance state, regional and national economic development produce relatively minor encroachments upon the states existing leased oyster beds in and near the harbor. It is important that these encroachments and other environmental impacts be kept to a minimum and, where possible, mitigated. I understand you will coordinate these and all other environmental impacts with my staff. Please use Mr. Arthur J. Rocque, Jr., Director of my Office of Planning and Coordination/Coastal Management as your point of contact for these matters.

In conclusion, I wish to reiterate our general support for your efforts towards improving Bridgeport Harbor and maintaining it as an efficient modern facility.

Sincerely,

Stanley J. Pac
Stanley J. Pac
Commissioner

SJP/AJR/mic